Amendments To The Specification

Please note that deletions are indicated in this paper with strikethrough, not double brackets, to avoid confusion because the original specification used single brackets in chemical equations and formulae.

Please replace the paragraph on page 18, lines 13 through 21, with the following amended paragraph:

Prospective Example 1

Hydrogen bromide gas (8.09 g/min) is directed to a mixing unit for contact with a slurry formed by combining sulfamic acid (11.64 g/min) and 50% hydrogen peroxide (~~13.6 g/min~~ 6.8 g/min). The overall reaction is:

$$\cancel{2H_2O_2}\underline{H_2O_2} + NH_2\text{-}SO_3H + HBr \rightarrow [Br][NH\text{-}SO_3H] + \cancel{3H_20}\underline{2H_2O} \quad ...(7)$$

The temperature and contact time are controlled so that the reaction is driven to completion and no unreacted H_20_2 remains in the reaction medium whereupon 50% NaOH (~~13.25 g/min~~28.0 g/min) is introduced to complete the process according to reaction (8).

$$[Br][NH\text{-}SO_3H] + NaOH \rightarrow [Br][NH\text{-}SO_3^-][Na^+] + H_2O \quad ...(8)$$

Please replace Table II on page 32 with the following amended Table II:

Table II

Example	Initial 50% NaOH charge /g	pH before TCCA addition	Second 50% NaOH charge /g	Amount D.I. wash water to mother liquors	Final pH	Wt % as Br_2 (Cl_2)	% Yield
2	22.0	NM	15.75	2 x 5ml	12.4	23.5 (10.45)	~~83.6~~ 87.0
3	22.0	1.5	14.95	1 x 5 ml	12.9	22.9 (10.2)	~~87.2~~ 80.1
4	22.0	NM	31.2	2 x 5 ml	12.6	22.05 (9.8)	~~84.5~~ 93.7
5	25.0	10.4*	20.0	2 x 5 ml	>12.5	24.36 (10.83)	~~93.3~~ 96.5
6	22.4	3.3	20.5	1 x 5 ml	13.25	23.32 (9.92)	~~94.5~~ 82.7
7	20.4	NM	25.0	1 x 5ml +1 x 2ml	13.0	22.36 (9.94)	~~95.5~~ 86.5
8#	20.5	NM	24.0	2 X 5 ml	12.93	21.96 (9.76)	~~94.3~~ 88.4

Please replace the paragraph on page 33, lines 1-23, with the following amended paragraph:

To a stirred reaction flask containing 48% hydrogen bromide (111.2 g) was added 50% H_2O_2 (16.96 g) dropwise so that the reaction flask temperature did not exceed 142° F. After allowing the reaction flask to cool to around 85° F, solid sulfamic acid (76.8 g) was introduced. The resulting slurry was stirred as 50% sodium hydroxide solution (91.9 g) was charged to the reaction flask to give a pH of 1.5. The flask was chilled during this process so that the temperature did not exceed 80-90° F. A single charge of granular trichloroisocyanuric acid (TCCA) (36.0 g) was introduced to the reaction flask that was stirred for 20 minutes. Most of the coarse TCCA granules were observed to have reacted within this period, as a fine powdery precipitate developed and the pH of the reaction medium was measured to be 1.5. Deionized water (28 g) was added to the reaction flask to facilitate the complete reaction of the TCCA. The cyanuric acid solid was removed by vacuum filtration and the filter cake was washed with deionized water (12.5 ml) that was not combined with the mother liquors. The wet filter cake was placed in an oven at 130° F for drying overnight. To the filtration mother liquors was added 50% NaOH (104 g), also with cooling, and at a rate such that the temperature did not exceed 80-90° F. Any additional solid cyanurate salts that developed were removed by vacuum filtration. The solids retained on the filter were washed with deionized water (5.0 g) and then dried in an oven at 130° F. Iodometric titration of the resultant golden yellow solution yielded a % Br_2 content of 23.7% (or 10.54% as Cl_2). The theoretical amount of Br_2 (or Cl_2 equivalent) produced

as a function of the sum of the hydrogen peroxide and TCCA charges was used to compute a reaction yield of ~~100%~~93.6%. The weight of the dried solids removed by filtration indicated that cyanuric acid and cyanurate salts were recovered in close to quantitative yield.

Please replace Table III on page 39 with the following amended Table III:

Table III

Example	Mass 50% H_2O_2 /g	Mass 48% HBr /g	Mass sulfamic acid /g	Mass $Ca(OCl)_2$ (59.5% av. Cl_2) /g	Mass NaOH /g (1) 1st (2) 2nd	Wt. % as Br_2 (Cl_2)	% Yield
10	4.22	27.82	19.2	11.0	(1)13 g 50% (2) 10g 50%+10g 100%	21.6 (9.6)	~~84.2~~ 83.5
11	8.48	55.6	38.4	24.22	(1) 26 g 50% (2) 8g 50%+13 g 100%	21.3 (9.48)	~~71.3~~ 70.8

Please replace the paragraph on page 56, lines 10 through 23, with the following amended paragraph:

In order to prepare a mixed halogen solution, a molar excess of organic chlorinating agent to bromide ions is employed. Employing a 10% molar excess of the ~~combination of hydrogen peroxide and~~ solid organic chlorinating agent over the bromide ions, yields a mixed halogen composition of 90 mole % bromine and 10 mole % chlorine. Suitable examples include, but are not limited to, trichloroisocyanuric acid (TCCA), sodium dichlorisocyanurate (NaDCC), sodium dichlorisocyanurate dihydrate (NaDCC.$2H_2O$), trichloromelamine, N-chloro-*p*-toluenesulfonamide, N-chloromethanesulfonamide, N-chlorosuccinimide, N,N'-1,3-bromochloro-5,5-dimethylhydantoin, N,N'-1,3-bromochloro-5-ethyl-5-methylhydantoin, and 1,3-dichloro-5,5-dimethylhydantoin. In this case, the organic chlorinating agent has dual functionality. First, it oxidizes all of the bromide ions into bromine which reacts with the sulfamic acid to form N-bromosulfamic acid as indicated in reaction (36). Second, the excess chlorinating agent releases soluble chlorine into the aqueous solution by complexing with sulfamic acid to form N-chlorosulfamic acid according to reaction (37).

Please replace the paragraph on page 57, line 22, through page 58, line 8, with the following amended paragraph:

In order to prepare a mixed halogen solution, a molar excess of inorganic chlorinating agent to bromide ions is employed. Employing a 10% molar excess of the ~~combination of hydrogen peroxide and~~ solid inorganic chlorinating agent over the bromide ions, yields a mixed halogen composition of 90 mole % bromine and 10 mole % chlorine. Suitable examples include lithium hypochlorite, calcium hypochlorite, and magnesium hypochlorite. In this case, the inorganic chlorinating agent has dual functionality. First, it oxidizes all of the bromide ions into bromine which reacts with the sulfamic acid to form N-bromosulfamic acid as indicated in reaction (38). Second, the excess chlorinating agent releases soluble chlorine into the aqueous solution by complexing with sulfamic acid to form N-chlorosulfamic acid according to reaction (39).

Please replace Table IV on page 62 with the following amended Table IV:

Table IV

Example	Reactant	Reactant assay /% as av.Cl_2	Initial 50% NaOH charge /g	Final 50% NaOH charge /g	Wt.% Br_2 (Cl_2)	% Yield
12	TCCA	90	9.65	10.0	14.76 (6.56)	~~100~~* 85.0
13	$Ca(OCl)_2$	59.5	0	22.0	14.4 (6.4)	~~91.5~~ 100.9

Please replace the paragraph on page 63, lines 2 through 20, with the following amended paragraph:

To a stirred reaction flask containing 40% NaBr solution (182g) was added deionized water (40g) and solid sulfamic acid (82.4g). The reaction medium was stirred and cooled as 50% sodium hydroxide solution (60.2g) was slowly introduced such that the temperature did not exceed 85° F. A single charge of granular trichloroisocyanuric acid (55g) was then added to the reaction flask that was stirred for around 20 minutes. All of the coarse TCCA granules were observed to have reacted within this period as a fine powdery precipitate developed. Prior to filtration, the pH of the reaction liquors was adjusted to 1.55 by addition of more 50% NaOH solution (5.0g). Upon filtration of the insolubles, the filtercake was washed with two bed volumes of deionized water. The wash liquors were discarded, and the filter wetcake was placed in an oven to dry overnight at 130° F. To the filtrates was added additional 50% NaOH (90g) again with cooling and stirring and at a rate such that the temperature of the reaction did not exceed 80-90° F. Any additional solids that precipitated from solution were removed by vacuum filtration, immediately upon completing the addition of the 50% NaOH. Iodometric titration of the resultant golden solution yielded a Br_2 content of 22.7% (or 10.1% as Cl_2). The theoretical amount of Br_2 (or Cl_2 equivalent) produced as a function of the amount of TCCA charged was

used to compute a reaction yield of ~~98.2%~~98.8%. The weight of the dry solids removed on the first filtration indicated that 86.6% of the cyanuric acid had been recovered.

Please replace the paragraph on page 64, lines 4 through 23, with the following amended paragraph:

To a stirred reaction flask containing 40% NaBr solution (91g) was added deionized water (131g) and solid sulfamic acid (82.4g). The reaction medium was stirred and cooled as 50% sodium hydroxide solution (60.2g) was slowly introduced such that the temperature did not exceed 85° F. A single charge of granular trichloroisocyanuric acid (55g) was then added to the reaction flask. Shortly after half of the TCCA was added, the bromine fumes in the flask were observed to subside. Compared to the process employing twice as much NaBr there were virtually no bromine vapors evident. It was not necessary to quell the fumes by addition of 50% NaOH prior to filtration. After about 20 minutes of stirring, all of the coarse TCCA granules were observed to have reacted as a fine powdery precipitate developed. Upon filtration of the insolubles, the filtercake was washed with 2 bed volumes of deionized water. The wash liquors were discarded, and the filter wetcake was placed in an oven to dry overnight at 130° F. To the filtrate was added additional 50% NaOH (95g) again with cooling and stirring, and at a rate such that the temperature of the reaction did not exceed 80-90° F. Any additional solids that precipitated from solution were removed by vacuum filtration, immediately upon completing the addition of the 50% NaOH. Iodometric titration of the resultant golden solution yielded a total halogen content of 21.1% when expressed as Br_2 (or 9.4% when expressed as Cl_2). The theoretical amount of Br_2 and Cl_2 equivalent produced as a function of the amount of the TCCA charge was used to compute a reaction yield of ~~91.3%~~92.0%.

Please replace the paragraph numbered (4) on page 90, lines 8 through 13, with the following amended paragraph:

(4) The alkali metal or earth alkali metal salt of anhydrous N-bromosulfamate is extremely stable if kept dry and in vacuo (see Example 24). Therefore, the product may be advantageously packaged and transported to a separate location for subsequent reconstitution by the simple addition of water to yield an aqueous stabilized liquid bromine-containing composition whose concentration can be tailored to the amount of reconstitution water used.

Remarks/Arguments

This preliminary amendment is submitted pursuant to 37 C.F.R. section 1.115 and MPEP section 714.01(e) to correct certain errors or mistakes in the specification which were discovered after the application was filed. The errors were discovered by the one of the inventors, Jonathan N. Howarth, in rereading the specification. See Declaration of Jonathan N. Howarth filed concurrently herewith. Applicants respectfully request that this preliminary amendment be approved as it is filed within three months of the filing date of the application. See 37 C.F.R. section 1.115(b)(2)(i).